



NAVAL
POSTGRADUATE
SCHOOL

Establishing an NPS ASW Certificate Program

**Undersea Warfare (USW) Academic
Committee**

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Establishing an ASW Certificate Program

Topics

- Motivations and student eligibility
- Directly supports USW curriculum
- Prerequisite and required courses
- Execution plan



Motivations

- Support reinvigorated needs Navy ASW
- Help restore USW student flow to NPS
- Sustainable plan for NPS faculty
- Complementing, not competing with existing ASW training and qualification
- Join NPS Distance Learning programs



ASW Certificate Eligibility

- Naval officers, active duty and reserve
- Government Laboratory Engineers
 - 2 USW graduates from NUWC, CSS
- Navy civilians: afloat and ashore staffs
- Navy enlisted: possible
 - DoD legal opinion: OK regarding enlisted participation in distance learning & Title X
 - USW Degree eligibility is a different issue



Directly supports USW curriculum

- Courses from all 4 major fields in USW core curriculum
- Students completing certificate qualify for 1 quarter of USW degree
 - in most cases
- Encourages further USW student enrollment at NPS
 - also exposes newcomers to NPS USW



Typical USW core curriculum

Prerequisites		ASW Certificate		
	MA1113/14 (4-0) Single Variable Calculus			OC2020 (2-2) Matlab Programming
1 - Fall	MA1115/16 (4-0) Multi-Variable Calculus	MA2129 (5-0) Ordinary Differential Equations	EC2410 (4-0) Systems and Signals	NW3230 (4-2) Strategy & Policy
2 - Winter	OS2103 (4-1) Applied Probability	OC3230 (3-1) Descriptive Physical Oceanography	EO3402 (3-1) Signals & Noise	MA3139 (4-0) Fourier Anal & PDEs
3 - Spring	OS3604 (4-0) Decision & Data Analysis	PH2401 (3-0) Intro Sonar Equations	UW3303 (4-1) USW Modeling & Simulation	NW3210 (2-0) NSDM pt 1
4 - Summer	OA3602 (4-0) Search & Detection	OC3260 (4-0) Sound in the Ocean	OC/MR3522 (4-2) Remote Sensing	NW3211 (2-0) NSDM pt 2
5 - Fall	OA4607 (4-0) Tactical Decision Making	PH3002 (4-0) Non-acoustic sensors, systems	UW3301 (?-0) USW in 20 th Century	Degree Elective
6 - Winter	XX0810 (0-8) Thesis Research	OC4270 (3-4) Tactical Oceanography	EC4450 (4-1) Sonar Systems Engineering	Degree Elective
7 - Spring	XX0810 (0-8) Thesis Research	PH3479 (4-0) Physics of USW Weapons	Degree Elective	Degree Elective
8 - Summer	XX0810 (0-8) Thesis Research	XX0810 (0-8) Thesis Research	Degree Elective	Degree Elective



Principles for Prerequisite Courses

- Prerequisite courses are necessary for planned ASW certificate courses
- Prerequisites are not part of ASW certificate, per se
- Not reducing USW course prerequisites
- These prerequisite courses are feasible
 - many students have these prerequisites already
 - common refresher courses
 - offered as part of NPS online resources



List of prerequisite courses

- **Probability and statistics**
 - OS2100 (web) – Dave Olwell
- **Calculus**
 - MA1117 (web) – Clyde Scandrett
- **Matlab programming**
 - OC2020 (web) – Arlene Guest
 - Alternate prerequisite: resident course EC1010



Certificate courses 1,2

- **Descriptive Physical Oceanography**
 - OC3230 (3-1)
 - prerequisites: none
 - Curt Collins & Arlene Guest, preparing for web
- **Search and Detection**
 - OA3602 (4-0)
 - prerequisites: OS2100 (alternate OS2103)
(can substitute for OS3604 for NPS UW students)
 - Alan Washburn, preparing for web



Certificate courses 3,4

- **Introduction to the Sonar Equations**
 - PH2401 (3-0)
 - prerequisites: none
 - Jim Sanders, asynchronous hard copy ready, web preparation complete
- **Signal Processing Introduction_**
 - EC2410 (4-0) Systems and Signals (similar to EC2402, EC2450)
 - prerequisites: MA1117
 - Roberto Cristi, available on web year round



Asynchronous DL: concerns

- ASW is challenging, cross-disciplinary
- We can't afford to dilute the high quality of NPS courses
- Preparation time consuming but feasible
- Asynchronous teaching of complex subjects not always practical or effective
- Professional time and work constraints can be a barrier for eligible students



Asynchronous DL: opportunities

- DLRC provides faculty support for preparing Web-based learning courses.
 - This has worked well
- UW has further capability to digitize video and build presentation Web pages
 - example: Hamming “Learning to Learn”
- Might first present synchronously (in person or VTC) in order to effectively create asynchronous versions



DLRC training 2003

- Jim Sanders, Curt Collins, Arlene Guest and Alan Washburn have all taken the OCL training with positive outcomes.
 - Course conversions: done, or nearly done
- Thus we're ready to go...



Long-term costs

- No travel, VTC or equipment required.
 - But note success of starting cohorts via one-week NPS trip, occasional remote classes in San Diego, etc.
 - More “lessons learned” needed, will progress
- Office of Continuous Learning (OCL) administers course outreach, schedule, admission, budgeting plans, etc.
- UW Academic Committee responsible for quality, maintenance of courses.
 - Our default answer: “can do, ready to go”



Execution Plan

- **ASW Certificate ready for initial offering**
 - ❑ E-mail queries: ASW-Certificate@nps.navy.mil
 - ❑ Fleet ASW Command is a likely customer
- **Next steps**
 - ❑ Scheduling courses for 2004, 2005 delivery
 - ❑ Finalizing ASW Certificate Brochure
 - ❑ Begin outreach to students: DLRC marketing, etc.
<http://online.nps.navy.mil> & <http://www.nps.navy.mil/usw>



Planned Course Schedule

- EC2450: self-paced, online
- PH2401: available April, October
- OC3230: available July, January
- OA3602 : available July, January



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- Tom Hazard, Office of Continuous Learning
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Clyde Scandrett, Alan Washburn
- CDR John Joseph, METOC/USW programs
- RADM John Pearson USN (Ret.), MIW Chair
- VADM Roger Bacon USN (Ret.), ASW Chair
- LCDR Steve Iatrou USN (Ret.), Information
Systems and Operations (ISO) curriculum



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Backup Slides

- Development support details
- Degree concerns regarding 1-quarter seat-time reduction addressed
- Possible future courses
- Individual course catalog descriptions
<http://www.nps.navy.mil/ofcinst/courses.htm>



Development support details

1

- Jim Sanders is further developing PH2401 from hardcopy to web delivery
 - **Receiving two 1/2 quarters salary, in progress**
- Curt Collins and Arlene Guest are reworking OC3230 Descriptive Physical Oceanography
 - **Receiving partial salary support**
 - Likely give OC3230 by VTE in 2004, also develop web-based version for subsequent delivery



Development support details

2

- Alan Washburn making OA3602 Search and Detection accessible asynchronously
 - **got ½ quarter salary support, in progress**
 - Might give OA3602 by VTE in 2003, to develop asynchronous version for subsequent delivery
- DLRC faculty proposal link:
 - http://www.dlrc.nps.navy.mil/dlrc_faculty_development/course_proposal.htm



Concern: 1-quarter degree reduction

- Direct reduction of seat time for UW degree by one quarter might not work for all students...
 - Factors like educational background, UW experience, years out of class, etc.
 - Evaluating 1-year IGEP and lab-student experiment, proof will be successful theses
- But is probably fine for most students



Future courses of interest available

- Mechanics
 - PH1121 (asynchronous hard copy)
- Others may be offered as considered. Variations in certificate offerings are approved by Undersea Warfare (UW) Academic Committee.



Future courses of interest possible

- Guest lecture series, videotaped online
- Daphne Kapolka: introductory acoustics
- Kevin Smith: acoustics propagation
- Mike Green idea: USW overview?
- Nonacoustic sensors PH3302
 - prerequisite: PH 1322 electromagnetics
- Possibly others



Individual course catalog descriptions

[http://www.nps.navy.mil/ofcinst/courses
.htm](http://www.nps.navy.mil/ofcinst/courses.htm)



EC2450 Signals and Systems

- An advanced review of continuous and discrete system theory intended for students who have previous education in these areas. Topics covered by each student will depend upon background and competence in the subject matter of EC2400, EC2410, and EC2320.
PREREQUISITE: Sufficient background in linear systems theory. Graded on Pass/Fail basis only.
- Available online, year round.



MA1117 Single Variable Calculus

- Review of analytic geometry and trigonometry, functions of one variable, limits, derivatives, continuity and differentiability; differentiation of algebraic, trigonometric, logarithmic and exponential functions with applications to maxima and minima, rates, differentials; product rule, quotient rule, chain rule; anti-derivatives, integrals and the fundamental theorem of calculus; definite integrals, areas, lengths of curves and physical applications; special methods of integration, including a two hour problem solving laboratory. PREREQUISITE: Precalculus mathematics.



OC2020: Matlab **Programming**

- Programming for scientists and engineers using the Matlab environment. Laboratory assignments are elementary problems in oceanography, physics, and mathematics.
- Web-based version available January 2004.
- Credit hours: 2-2
- PREREQUISITE: Pre-calculus algebra.



OA3602 Search Theory & Detection

- Search and detection as stochastic processes. Characterization of detection devices, use and interpretation of sweep widths and lateral range curves, true range curves. Measures of effectiveness of search-detection systems. Allocation of search efforts, sequential search. Introduction to the statistical theory of signal detection. Models of surveillance fields, barriers, tracking and trailing.
PREREQUISITE: OS2103 or OA3101.



OC3230 Descriptive Physical Oceanography

- Physical properties of seawater. Processes influencing the distribution of heat, salt and density in the ocean. Static stability in the ocean. Circulation and water masses in the ocean. Laboratory work involves collection and analysis of actual data using principles developed in class.



OS2100 Probability And Statistics

- An introduction. Topics include probability laws and calculation methods, conditional probability, discrete and continuous random variables, common probability distributions, introduction to modeling, expectation, variance, covariance, and rudiments of discrete time processes. Confidence intervals, hypothesis testing, and regression. Emphasis is on understanding uncertainty and developing computational skills.
PREREQUISITE: Single variable calculus



PH2401 Introduction To The Sonar Equations

- A discussion of each term of the sonar equations, with application to the detection, localization, and classification of underwater vehicles. Topics include ray acoustics, simple transmission loss models, tonals, spectrum and band levels, directivity index, array gain, doppler shift, and detection threshold. This course is intended primarily for students in the Undersea Warfare curriculum and is given in a “structured” PSI mode. **PREREQUISITE:** Precalculus mathematics.